S-1 BLACK-LIGHT INSECT-SURVEY TRAP Plans and Specifications

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Illustrations

S-1 BLACK-LIGHT INSECT-SURVEY TRAP
Plans and Specifications

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INTRODUCTION

Electric insect traps are valuable research and survey tools for determining the presence of certain nocturnal insects and for obtaining indices of their population levels. Omnidirectional traps equipped with 15-watt black-light lamps as the attractants are used routinely by numerous Federal and State agencies and nongovernmental groups. One application is the detection of foreign insects arriving at U.S. ports of entry, and the S-1 survey trap described herein was developed for this program. However, it conforms closely to the standards for general insect-survey traps proposed for the Entomological Society of America by Harding et al.[5] and is suitable for numerous applications for which comparable insect collection data must be obtained from various locations. The assembled trap, shown in figure 1, consists of baffle assembly, black-light lamp, funnel, collection container, tripod, and electrical components.

The design incorporates suggestions gained from field experience of personnel in both the Animal and Plant Health Inspection Service and the Agricultural Research Service of the U.S. Department of Agriculture. It is based upon the dimensions or characteristics of certain critical components that are unique, that have proven effective in use, or that are needed for comparability or interchangeability with existing equipment. These critical components are designated in "Specifications." Less critical commercial products were also used in determining the di-

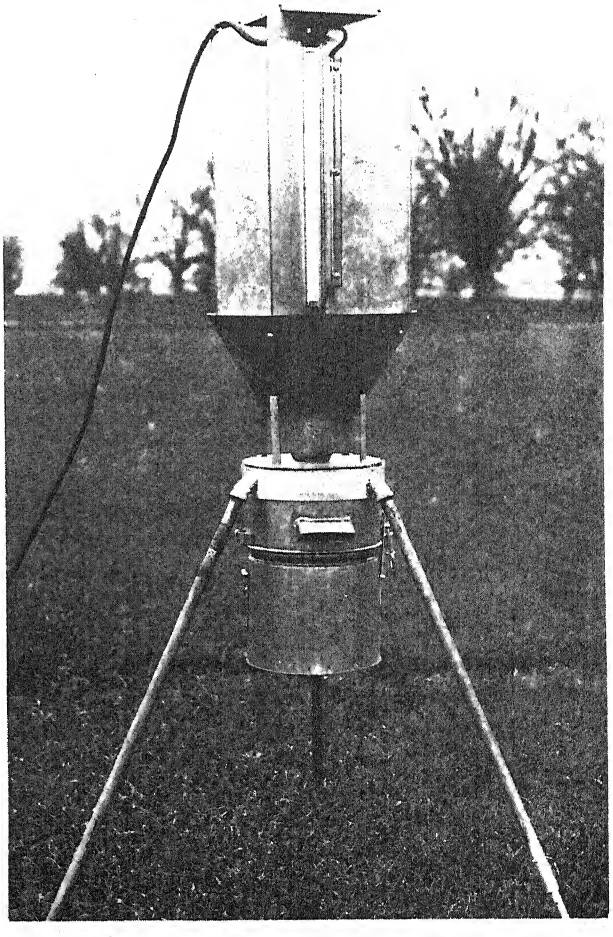

FIGURE 1.—Assembled S-1 black-light insect-survey trap.

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[5] Harding, W. C., Jr., Hartsock, J. G., and Rohwer, G. G., 1966. Black-light trap standards for general insect surveys. Bull. Entomol. Soc. Amer. 12(1): 31–32.

mensions. In selecting these noncritical components, a fabricator should check dimensions against the space allowances, mounting holes, etc. shown on the drawings and make necessary adjustments.

The traps must operate outdoors under a variety of climatic conditions and, therefore, must be weatherproof and corrosion resistant. To insure that components will be interchangeable among units and that traps can be assembled and serviced without excessive binding or other difficulties, dimension tolerances of all parts must be controlled.

These plans and specifications produce a trap for operation from a 120-volt, 60-Hz a.c. Since it is frequently necessary to operate insect traps at remote locations from battery power, the internal wiring of the electrical box is arranged to accommodate an externally mounted inverter-ballast device operated from a battery and connected to the trap by a similar but differently wired power connecter. These accessories are shown schematically in figure 2 but will be described in a separate publication.

SPECIFICATIONS

The traps are to be fabricated from 22-gage galvanized sheet metal unless designated otherwise. They should be equipped with electrical components and wired for service according to the following specifications and drawings (fig. 3, sheets 1–4). Dimension standards must be maintained so that parts may be interchanged among traps. It will be necessary to change

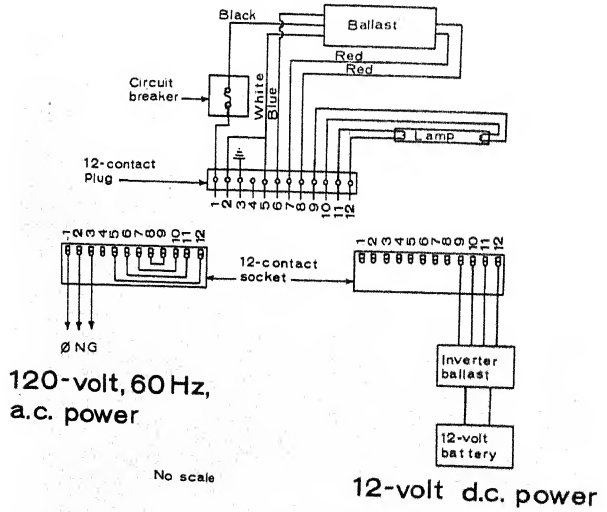

FIGURE 2.—Wiring diagram for S-1 black-light insect-survey trap.

lamps periodically; therefore, dimensions relating to the positioning of lampholders must be accurate. The dimensions on the drawings do not allow for seams, joints, or wire reinforcement. Finished units are to be of the dimensions shown. Rust-resistant hardware should be used for assembly of the trap.

Spot welding should be performed as noted on the drawings. To insure good spot-welds, the electrodes must be kept in good condition, and current and pressure suitable for the gage of galvanized metal used must be applied to each weld. Spot-welds on the funnel seams are in one row and are spaced approximately one-half inch apart. Other areas requiring spot welding should have welds spaced no more than one-half inch apart in any direction. Closer spacing may be required for securely welding some parts. All welds should be painted with a heavy coat of zinc protective metal paint.

Baffle Assembly

The baffle assembly consists of two sections with two baffle panels per section. The two sections are connected by cotter pins as shown on sheet 3. The two baffle panels forming a baffle section must have the inner hem folded in opposite directions to provide a smooth surface for spot welding brackets B_1 and B_2. (See "Baffle Assembly Cross Section" on sheet 3.) The two sections forming the baffle assembly are identical except that one section will contain the wiring trough. The baffle assembly is attached to the upper funnel with a $\frac{1}{4}$- by $\frac{3}{8}$-inch rustproof stove bolt screwed into a tapped lug or nut spot-welded or soldered to the lower flange of each baffle panel. Brackets for alining and securing lampholders are spot welded to the baffle sections.

The spring used to hold the lampholders tight against the lamp ends must be galvanized or otherwise rustproof and have a stiffness of 8 to 10 pounds per inch of compression. This spring should not exceed a stiffness of 10 pounds for ease and safety in lamp removal and replacement. The galvanized spring cap should be securely attached to the spring top with not less than 3 tabs crimped to the spring and without protruding sharp or ragged edges.

The wiring trough is fabricated free of rough edges that might damage insulation on the cord to the lower lampholder (sheets 2 and 3). The trough is fastened to the baffle by three ¼- by

⅜-inch rustproof stove bolts screwed into tapped lugs or nuts spot-welded or soldered to opposite sides of the baffle. The trough should be readily removable for servicing the trap.

Funnels

The upper and lower funnels are fabricated by lapping the two edges and spot welding (sheet 1). Where the upper funnel joins the collection container, the joint must be soldered watertight to the container cover. The four funnel supports are positioned to aline with the baffles and are then spot-welded to the container cover and to the funnel. Supports are formed from 16-gage galvanized metal straps. The bolt holes in the baffle are accurately located and spaced 45° apart on the semicircular sheet forming the upper funnel. The killing agent pan is fabricated by spinning or seaming galvanized sheet metal. The lower funnel is securely attached to the killing agent pan by a watertight soldered joint. The killing agent wick is cut from ½-inch-thick Celotex wallboard having no asphalt or foil vapor-barrier surface. Celotex is resistant to the probable killing agent, ethyl acetate; its swelling characteristics are not troublesome, and its volatilization characteristics with ethyl acetate have proven to be satisfactory. To control the rate of evaporation of ethyl acetate, a cover for the killing agent pan is necessary. (See sheet 1 for details on the killing agent wick and pan cover.) The trap user will have to determine by experience the degree of cover necessary for the existing conditions. The sealing gasket is made of resilient polyurethane-foam stripping, one-fourth inch thick by one-half inch wide, extending completely around the outside of the lower funnel alined one-fourth inch from the outside edge. If the gasket is fastened too close to the edge, it will bind on the top of the collection container when the funnel is inserted. The gasket can be securely attached to the funnel with silicone rubber adhesive, either General Electric type RTV or Dow-Corning Silastic. The bond of the polyurethane to the galvanized metal must resist ethyl acetate, and these adhesives have proven to be satisfactory.

Collection Container

The collection container is fabricated with top and bottom seams as detailed on sheet 1. The side seam is a tightly crimped lock seam. The bottom edge of the upper section is rolled over an 11-gage galvanized-steel wire to provide a strong smooth edge. Upper and lower sections of the container are joined by a pipe slip joint. The lower funnel must readily fit into the opening in the lower section, rest securely on the ¼-inch-deep internal bead on the lower section of the container, and be easily removed. The rain drain opening is cut in the upper section (sheets 1 and 2), and the rain shield is attached by soldering it watertight across its top and on each side. The drain hanger is spot welded on the inside of the upper section. The lower section is supported from the upper section by a 4½-inch safety hinge hasp with an adjustable staple on one side and a 5-inch strap hinge directly opposite (sheet 2). The hasp and the strap hinge are zinc coated. The strap hinge has to be bent and shaped as noted for indicated fit. Tinners' rivets are used to fasten the hinge and hasp to the collection container. Care should be exercised in the bending and shaping operation so as not to break the zinc coat on the hinge; if broken, it should be painted with zinc protective paint.

The rain drain is fabricated as detailed on sheet 1. Watertight soldered joints in the construction of the spout and connection of the pan are necessary. The 16-mesh copper screen disk should be soldered completely around its circumference to the underside of the top cover ring. This ring should make a snug fit on the pan, but be readily removable to enable cleaning of insect scales from pan and spout.

Tripod

A tripod is used to support the trap (sheets 1 and 4). The 45°-angle pipe elbows used for attaching the legs have one end cut to make them essentially 60°-angle elbows. All welds are of the electric arc type. Care must be exercised in welding the pipe elbows to the tripod ring to provide a substantial joint with legs positioned at the prescribed angle. Welds are extended completely around the pipe elbows. The adjustable leg is designed so that its length can be easily changed to enable trap leveling. Finished welds are thoroughly scaled and cleaned before applying protective paint. The tripod ring is sized so that it will form a tight fit around the upper part of the collection container when the tripod bolt is tightened, in order to support the weight of the trap. Three 5/16- by 8-inch galvanized gutter spikes are used for anchoring the tripod to the ground.

Electrical Components

Components that are unique and in use are indicated by name. The number required is shown in brackets.

Lamp [1]: Black-light, fluorescent, General Electric F15T8/BL, 120-volt. This lamp should be used to provide spectral characteristics and radiation output comparable to other units in service in the field.

Lampholder [2]: One General Electric GE-95x178, 12-inch length, and one General Electric GE-95x905, 30-inch length, both with sunlight-resistant neoprene insulation. The dimensions of the baffle assembly and the provision of the compression spring are arranged to accommodate these unique, molded lampholders, 1⅛ inch in diameter by ⅞ inch thick, with a molded water-sealing ring. Splicing of lampholder cords in the wire trough is not permitted.

Ballast [1]: Low-power-factor, trigger-start, Class P for 1-F15T8-120-volt lamp, 6-inch mounting distance, 6½-inch maximum length, 1⅞-inch maximum width, 1⅜-inch maximum height.

Circuit protector [1]: Weatherproof circuit breaker mounted on electrical box base, 2-ampere rating at 110 to 120 volts a.c., trip-free contact action, automatic reset. Miniature size: maximum length 2 inches, maximum width 1⅜ inches, maximum height 1-5/16 inches. Capacity: carry 110% rated current, trip at 130% at 25°C. Kilixon PDA-2 (Texas Instruments, Inc.) or equal.

Trap-power connecter [1]: Cinch-Jones series 300 No. P-312-DB plug, recessed 12-contact male connecter rated at 730 volts rms. This connecter is specified to establish a standard for interchangeability of units and to accommodate accessories for battery operation. The connecter is mounted in the base of the electrical box and wired as noted on sheet 4.

Power-cord connecter [1]: Cinch-Jones series 300 No. S-312-CCT socket, 12-contact female connecter to mate with trap-power connecter. Socket connecter is installed on the trap end of the power supply cord and wired as noted on sheet 4.

Power supply cord and cap [1]: Power supplied to the electrical box will be 115 to 120 volts, 60 Hz, a.c. A 10-foot No. 18-3 SJ0 or SJT power cord, resistant to sunlight, is used. It is terminated at one end with the power-cord connecter and at the other end with a connecter cap, three-wire grounding, polarized, rated 15 amperes at 125 volts, rubber-covered, and including cord grip. A prefabricated cord assembly of equal quality not less than 8 feet long with molded cap as described and with SJ0 or SJT conductor size No. 16-3 may be substituted.

Electrical Circuitry

The circuit shown (sheet 4) is for a.c. operation only. Three contacts of the 12-contact trap-power connecter attach to the ballast input, with the "hot" conductor passing through the circuit protector. The ballast output is attached to 4 more contacts of the connecter and the lamp filament leads are connected to another 4 contacts (11 total contacts used). Insertion of the power-cord connecter supplies energy to the ballast input and connects the ballast output to the lamp filament leads. For d.c. operation a separate supply cord will be used to connect the output of an inverter-ballast device directly to the lamp filament leads. Circuits for both a.c. and d.c. operation are shown in figure 2.

The electrical box is constructed as specified on sheet 4. Mounting of the ballast, circuit breaker, and 12-contact power connecter to the box base is with rust-resistant stove bolts or rivets, size as required. Lampholder cords are protected and restrained where passing through the metal base by a molded-plastic cord-strain relief.

The connection of conductors to the 12-contact plug is by soldering to pins, as designated, to provide a good connection, both electrically and mechanically. The leads to the various pins on the plug are passed through appropriate sizes of shrinkable polyolefin tubing of 0.020-inch minimum wall thickness before soldering to the pins. After the leads have been soldered, the individual pieces of tubing are slipped over the respective connection and shrunk to a snug fit to provide insulation.

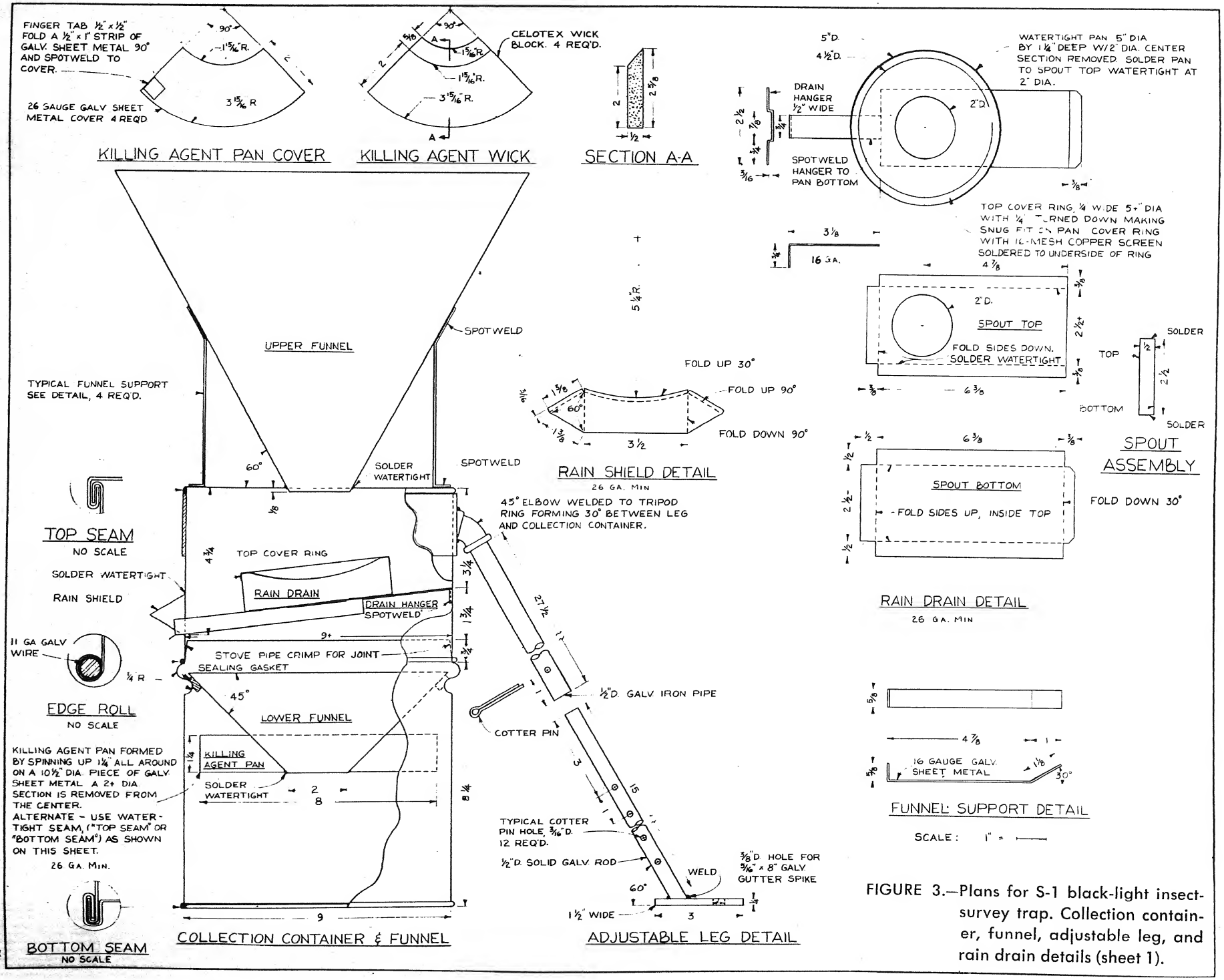

FIGURE 3.—Plans for S-1 black-light insect-survey trap. Collection container, funnel, adjustable leg, and rain drain details (sheet 1).

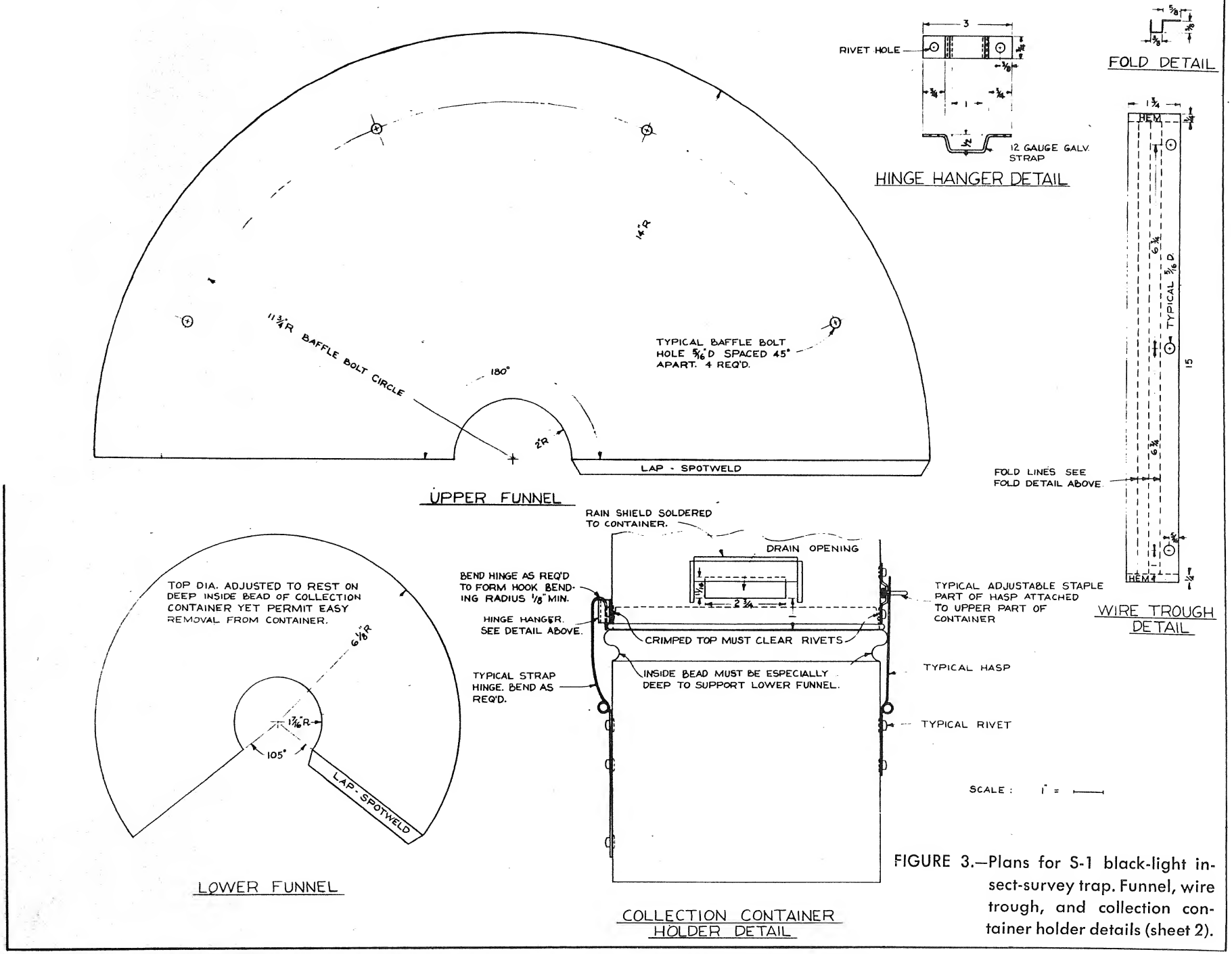

FIGURE 3.—Plans for S-1 black-light insect-survey trap. Funnel, wire trough, and collection container holder details (sheet 2).

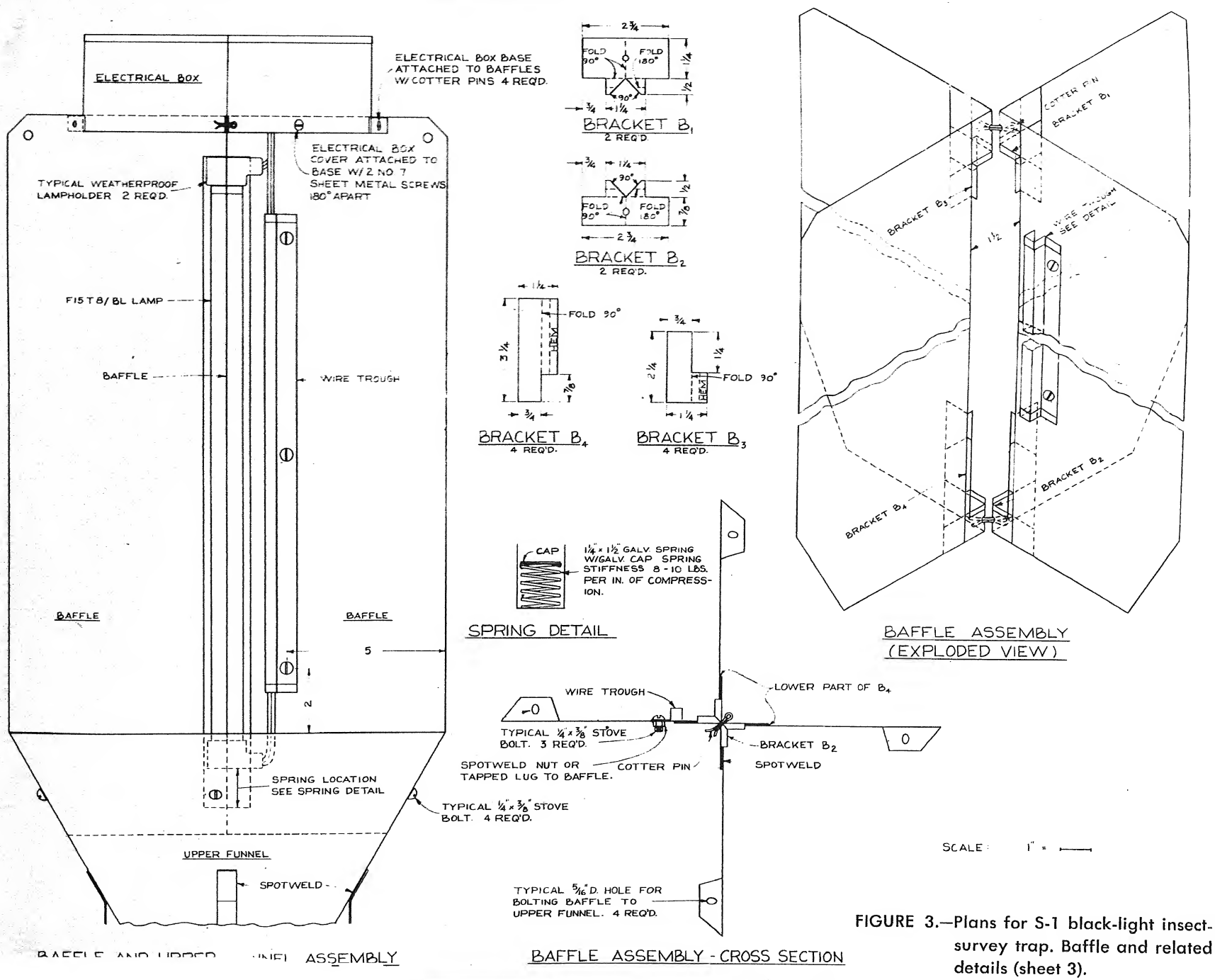

FIGURE 3.—Plans for S-1 black-light insect-survey trap. Baffle and related details (sheet 3).

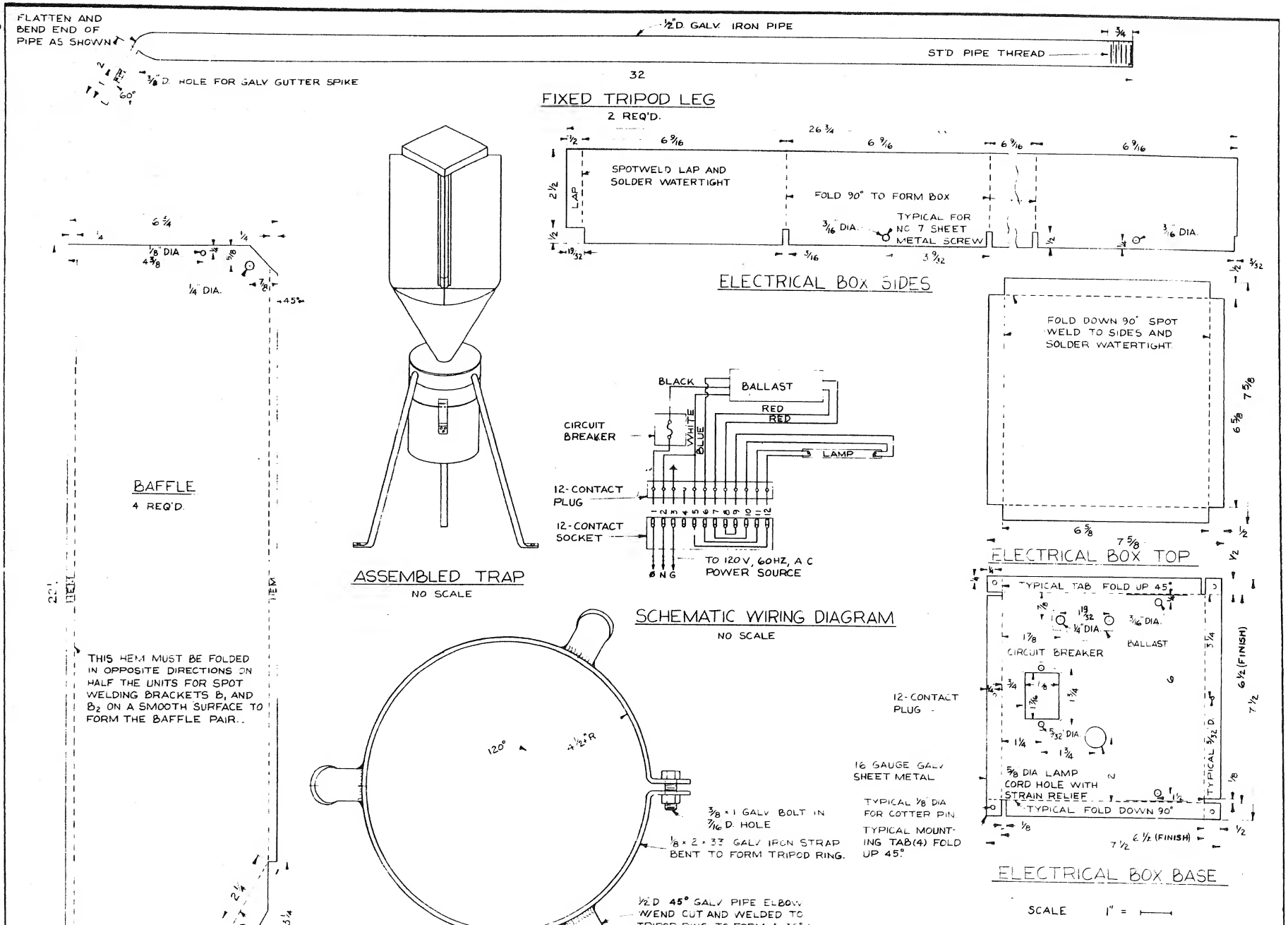

FIGURE 3.—Plans for S-1 black-light insect-survey trap. Electrical box, baffle, tripod leg, tripod ring, and miscellaneous details (sheet 4).